PATENT ABSTRACTS OF JAPAN

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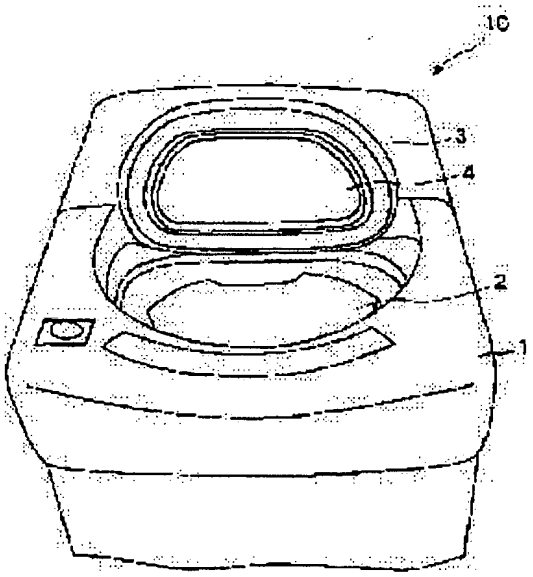
(54) WASHING/DRYING MACHINE

(57)Abstract:
PROBLEM TO BE SOLVED: To enhance drying efficiency by adding a drying promoting function to warm-air drying, in a drying process of a washing/drying machine.
SOLUTION: A sprayed coating film 4, which is composed of a far-infrared radiator, is formed on an inner surface of an inner lid 3 of the washing/drying machine, so that the drying efficiency can be enhanced. The coating film is formed, particularly, by using thermal spraying, so that a coating thickness can be made small and so that the production cost of the far-infrared radiator can be reduced. The use of coal combustion ash as a material for the far- infrared radiator can bring about not only a reduction in material cost but also the effective utilization of waste. Additionally, the sprayed coating film 4, which is composed of the far-infrared radiator, is heated with a heater unit 34 which is installed in the inner lid 3, so that far-infrared radiation from the far-infrared radiator can be increased.



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CLAIMS

[Claim(s)]
[Claim 1] The wash dryer characterized by forming the thermal-spraying coat which becomes the inner surface of the inner lid of the wash dryer equipped with the wash function and the desiccation function from a far-infrared radiator.
[Claim 2] The wash dryer according to claim 1 using coal combustion ashes as an ingredient of said far-infrared radiator.
[Claim 3] The wash dryer according to claim 1 or 2 which installed the heater which heats the thermal-spraying coat which consists of a far-infrared radiator in the inner lid.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the technique which raises the drying efficiency of the wash dryer especially equipped with the wash function and the desiccation function about the dryer which dries clothing after washing.
[0002]
[Description of the Prior Art] As for the wash dryer equipped with the wash function and the desiccation function, in addition to the thing for the conventional businesses, a thing for home use is also being put in practical use in recent years. Drawing 5 is an example of a wash dryer for home use. The wash dryer machine 50 A body 51 and wash-cum-the dehydration tack 53 which was supported inside this body 51 and which won popularity and was supported free [a revolution] inside the cylinder 52 and the receptacle cylinder 52, The rotary wing 54 which has the configuration of an abbreviation NABE mold with the ramp which was prepared in the pars basilaris ossis occipitalis of wash-cum-the dehydration tack 53, and started at right angles to the periphery section, and aslant, It connects with the wash shaft 55 which attached the rotary wing 54, and is constituted by the motor 56 fixed to the receptacle cylinder 52, the warm air air blasting means which consists of a fan 57 and a heater 58, the circulation dehumidification path 59, the inner lid 61 with which the air blasting opening 60 was formed.
[0003] And forward counterrotation actuation of the rotary wing 54 is intermittently carried out by the motor 56 at the time of a desiccation process, and clothing is agitated, and the air ventilated by the fan 57 is heated at a heater 58, and it sends in from the air blasting opening 60 in wash-cum-the dehydration tack 53 through the elasticity tube 62. And divergence of the moisture contained in clothing progresses because the clothing agitated by the rotary wing 54 and warm air contact. Repeating such stirring to forward hard flow intermittently, and performing it, it dehumidifies by condensing the moisture contained in warm air in the circulation dehumidification path 59, and sends in as warm air in wash-cum-the dehydration tack 53 at a heater 58 with a fan 57 again, and clothing is dried. Clothing is dried repeating this flow.
[0004] Drawing 6 is an example of the wash dryer for businesses, in this drawing, 103 is a tub outside a washer, in this tub 103 outside a washer, the cistern 102 which carries out opening to a front-face side is arranged, and the washing input port sealed with the lid which is not illustrated is formed in the front face of the tub 103 outside a washer which attends opening of this cistern 102. Furthermore, in the cistern 102, the drum 101 which holds the washing is arranged pivotable at the circumference of a horizontal axis. Moreover, the detergent input port 104 which supplies a detergent, a fabric softener, a bleaching agent, etc. is established in one flank of the tub 103 outside a washer of the cistern 102 upper part.
[0005] The desiccation processor of this wash dryer 100 is what constitutes the circulation path which is made to dehumidify and dry the moist air exhausted from the drum 101, and is returned to a drum 101. When drying the circulation duct 105 which lets a circulation wind pass, the fan 106 of the desiccation style who circulates a wind, and the washing It has the heater 108 for drying the washing which heated the cooling dehumidification duct 107 and circulation wind which the drum exhaust air and cooling water which were alike, and heat exchange was carried out and became low temperature are made to react, and carry out water-cooled dehumidification, and was held in the drum 101. Moreover, 109 is a heat exchanger which carries out heat exchange of heat-and-high-humidity drum exhaust air and the low-humidity/temperature air after water-cooled dehumidification, when drying the washing. The inclination of dozens of times is established applying [this / 109] it to an outlet side from the entry side of drum exhaust air, and even when the air which came out of the drum 101 and which contained the steam so much dews in a heat exchanger 109, it can drain it automatically.
[0006] the elevated temperature around 60 degrees C which contains a steam so much which came out of the drum 101 when a heater 108 is energized and desiccation was started at the desiccation process with this wash dryer 100 -- humid exhaust air After the waste thread under exhaust air is caught with a filter 110, in a heat exchanger 109, heat exchange is carried out to the air around 30 degrees C with which the low warm air and indoor air after water-cooled dehumidification were mixed, and it becomes the air of the low temperature around 40 degrees C. A part of moisture contained in that air dews within a heat exchanger 109, and flows out of the exhaust port of the cooling dehumidification duct 107 according to the inclination of the heat exchanger 109 which leaned dozens times (this operation gestalt about 30 degrees), and was installed. moreover, the air of the low temperature around 40 degrees C by which heat exchange was carried out is further cooled with tap water within the cooling dehumidification duct 107 -- having -- the low temperature around 35 degrees C -- it becomes damp air and the low temperature side of a heat exchanger 109 is supplied as low warm air after water-cooled dehumidification (air for cooling). The water and tap water which were condensed out of air within this cooling dehumidification duct 107 are drained from an exhaust port. moreover, the air supplied to the low temperature side of a heat exchanger 109 incorporates the indoor air (air of the duct exterior) inhaled by work of the fan 106 of the desiccation style from some holes of the duct of the upstream, and it carries out heat exchange in a heat exchanger 109 -- having -- the low temperature around 38 degrees C -- after becoming damp air, after being heated before and after 120 degrees C at a heater 108, a drum 101 is supplied, and the washing is dried.
[0007]
[Problem(s) to be Solved by the Invention] By the way, although desiccation of the clothing in the conventional wash dryer is dried by the warm air heated at the heater, the air capacity and the blasting force of warm air which are sprayed to the clothing on the structure of a wash dryer and in wash-cum-a dehydration tack are not enough, and there is a problem that drying efficiency is low and desiccation takes long duration, in desiccation by this warm air. The lowness of the drying efficiency by such warm air is not restricted to a wash dryer, and is the same also in the clothes dryer of dedication.
[0008] On the other hand, in order to raise the drying efficiency of a dryer, sticking a far-infrared radiator on the device inner

surface of a dryer <TXF FR=0001 HE=250 WI=080 LX=0200 LY=0300> is already known. For example, stretching the ceramics as a far-infrared radiator inside the dry matter-ed hold section of a clothes dryer or a tableware dryer to JP,7-9282,U is indicated. However, the presentation of the ceramics as a far-infrared radiator and the publication about the approach to description or a device inner surface stick are not in this official report, and the concrete effectiveness by this is not indicated, either.
[0009] In the desiccation process of a wash dryer, the technical problem which this invention should solve adds a desiccation acceleration function to desiccation by warm air further, and is to raise drying efficiency more.
[0010]
[Means for Solving the Problem] This invention is characterized by forming the thermal-spraying coat which becomes the inner surface of the inner lid of the wash dryer equipped with the wash function and the desiccation function from a far-infrared radiator. Here, the plasma metal spray approach is employable as the thermal-spraying approach, using coal combustion ashes as an ingredient of said far-infrared radiator. Furthermore, the thermal-spraying coat which installs a heater in an inner lid and becomes it from a far-infrared radiator can also be heated.
[0011] In this invention, the thermal-spraying coat which becomes the inner surface of the inner lid of a wash dryer from a far-infrared radiator is formed. Since the far-infrared radiator used with the conventional dryer is a Plastic solid manufactured by the sintering process, according to the magnitude of the plane area of a Plastic solid, thickness becomes thick inevitably, if it is the magnitude of the plane area of an inner lid inner surface, several mm or more will be needed and, as for thickness, the fabrication cost of a far-infrared radiator will become high. On the other hand, since coating thickness can be adjusted to about 0.05-0.2mm regardless of the magnitude of the plane area of a far-infrared radiator when based on a spraying process, coating thickness can be made thin within limits from which required far-infrared Radiation Effects is acquired, and the fabrication cost of a far-infrared radiator can be reduced.
[0012] as the ingredient of a far-infrared radiator -- sinter molding -- the ceramic fine particles conventionally used as the body and its function can be used. Moreover, coal combustion ashes can also be used. When coal combustion ashes are used, while being able to reduce ingredient cost, it also becomes effective use of trash.
[0013] Coal combustion ashes are the fines which used the oxide of aluminum, Si, and Fe as the principal component, and a thermal-spraying object has a good far-infrared radiation property by being put to an elevated temperature in the combustion process of coal, and being further put to an elevated temperature in a thermal-spraying process. The ashes after coal combustion are fines which are about several micrometers, and particle size adjusts particle size of these fines (classification, grinding), and makes them the particle size of about 10-70 micrometers which can be adapted for thermal spraying.
[0014] Since high thermal-spraying temperature is needed when using ceramic fine particles and coal combustion ashes as an ingredient of a far-infrared radiator, it is desirable to use a plasma spraying equipment as thermal spraying equipment used for thermal spraying. The plasma spraying equipment itself is well-known, for example, it can form a thermal-spraying coat in JP,7-62517,A, JP,8-109463,A, JP,8-225912,A, etc. using the thermal spraying equipment of a publication.
[0015] Moreover, radiation of the far infrared rays from a far-infrared radiator can be further raised by installing a heater in the inner lid of a wash dryer, and heating the thermal-spraying coat which consists of a far-infrared radiator.
[0016]
[Embodiment of the Invention] Drawing 1 is drawing showing an open beam condition for the inner lid of the wash dryer in the operation gestalt of this invention. Drawing 2 is drawing showing the cross-section structure of an inner lid. The basic configuration of the wash dryer 10 is the same as that of the wash dryer shown in drawing 6 , it is supported free [a revolution of wash-cum-the dehydration tack 2] inside a body 1, and wash-cum-the dehydration tack 2 is formed in the lid 3 in a wrap.
[0017] At the desiccation process of the washing with this wash dryer 10, it changes into the condition of immobilization of wash-cum-the dehydration tack 2, and the inner lid 3 is shut, forward counterrotation of the rotary wing in wash-cum-the dehydration tack 2 (not shown) is carried out intermittently, the washing is agitated, warm air is sent in in wash-cum-the dehydration tack 2, and the washing is dried. In this desiccation process, the thermal-spraying coat 4 which consists of a far-infrared radiator with the heater unit 34 prepared in the interior of the inner lid 3 is heated, and desiccation of the washing is promoted with the far infrared rays emitted from the thermal-spraying coat 4.
[0018] As the cross-section structure of the inner lid 3 is shown in drawing 2 , the rib 33 made from aluminum is formed between the heat insulator 31 made of synthetic resin, and an aluminum plate 32, and the heater unit 34 is formed in the section formed with each rib 33. The thermal-spraying coat 4 with a thickness of about 100 micrometers it is thin from a far-infrared radiator is formed in the background of the aluminum plate 32 of this inner lid 3. The thermal-spraying coat 4 carries out thermal spraying of the ceramic fine particles as a far-infrared radiator with a plasma spraying equipment, and forms them.
[0019] [Example of a trial] The ceramic fine particles (K-166 trade name) by Showa Denko K.K. were used as a far-infrared radiator. The thermal-spraying coat with a thickness of about 100 micrometers was formed in the inner surface of the inner lid of a wash dryer by using these ceramic fine particles as a thermal spray material. The heater was formed in the interior of an inner lid, the on-off switch of a heater was formed, and the comparative study of drying efficiency was performed combining the existence of heater heating.
[0020] A test result is shown in drawing 3 and drawing 4 . In both drawings, O mark is a test result with a wash dryer with the inner lid of the conventional type which does not form the far-infrared radiator coat, - mark and ** mark are the wash dryers of this invention which formed the far-infrared radiator coat in the inner lid, and - mark is a test result in with heater heating in heater heating nothing and ** mark.
[0021] Drawing 3 is a graph which shows the relation between the weight of a dry matter-ed, and the drying time. With the wash dryer in which the far-infrared radiator coat was formed, the drying time is shortened by the inner lid 10 to 20% compared with the conventional wash dryer so that drawing 3 may show. In with heater heating, as compared with the case where he has no heater heating, the drying time is shortened further.
[0022] Drawing 4 is a graph which shows the relation between the weight of a dry matter-ed, and power consumption. compared with the wash dryer conventional with the wash dryer which formed the far-infrared radiator coat in the inner lid, power consumption is comparable so that drawing 4 may show -- or it decreases 5 to 10%. Although power consumption increases a little as compared with the case where he has no heater heating in with heater heating, it still does not increase from the case of the conventional wash dryer.
[0023] A table 1 is a table showing an example of the component of coal combustion ashes. Coal combustion ashes use SiO2, aluminum 2O3, and Fe2O3 as a principal component, in addition contain CaO, TiO2, etc., and are the ceramics as a far-infrared radiator, and a similar component. When the thermal-spraying coat was formed in the inner surface of the inner lid of a wash dryer by using these coal combustion ashes as a thermal spray material, the same result as the test result shown in drawing 3

and drawing 4 was obtained.
[0024]
[A table 1]

成分	含有量 %
SiO_2	55.78
Al_2O_3	22.15
Fe_2O_3	6.84
CaO	2.30
TiO_2	1.69
P2O5	0.73
Na2O	0.58
K2O	0.57
MgO	0.42
SO3	0.39
その他	7.48

[0025] In addition, although the above was the example which applied this invention to the wash dryer for home use, the same result was obtained also in the drying test which applied this invention to the wash dryer for businesses.
[0026]
[Effect of the Invention] Drying efficiency can be raised by forming the thermal-spraying coat which becomes the inner surface of the inner lid of a wash dryer from a far-infrared radiator. Since it is coat formation especially by thermal spraying, coating thickness can be made thin and the fabrication cost of a far-infrared radiator can be reduced.
[0027] When coal combustion ashes are used as an ingredient of a far-infrared radiator, while being able to reduce ingredient cost, it also becomes effective use of trash. Moreover, radiation of the far infrared rays from a far-infrared radiator can be further raised by heating the thermal-spraying coat which installs a heater in an inner lid and becomes it from a far-infrared radiator.

[Translation done.]

* NOTICES *

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the technique which raises the drying efficiency of the wash dryer especially equipped with the wash function and the desiccation function about the dryer which dries clothing after washing.

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PRIOR ART

[Description of the Prior Art] As for the wash dryer equipped with the wash function and the desiccation function, in addition to the thing for the conventional businesses, a thing for home use is also being put in practical use in recent years. Drawing 5 is an example of a wash dryer for home use. The wash dryer machine 50 A body 51 and wash-cum-the dehydration tack 53 which was supported inside this body 51 and which won popularity and was supported free [a revolution] inside the cylinder 52 and the receptacle cylinder 52, The rotary wing 54 which has the configuration of an abbreviation NABE mold with the ramp which was prepared in the pars basilaris ossis occipitalis of wash-cum-the dehydration tack 53, and started at right angles to the periphery section, and aslant, It connects with the wash shaft 55 which attached the rotary wing 54, and is constituted by the motor 56 fixed to the receptacle cylinder 52, the warm air air blasting means which consists of a fan 57 and a heater 58, the circulation dehumidification path 59, the inner lid 61 with which the air blasting opening 60 was formed.
[0003] And forward counterrotation actuation of the rotary wing 54 is intermittently carried out by the motor 56 at the time of a desiccation process, and clothing is agitated, and the air ventilated by the fan 57 is heated at a heater 58, and it sends in from the air blasting opening 60 in wash-cum-the dehydration tack 53 through the elasticity tube 62. And divergence of the moisture contained in clothing progresses because the clothing agitated by the rotary wing 54 and warm air contact. Repeating such stirring to forward hard flow intermittently, and performing it, it dehumidifies by condensing the moisture contained in warm air in the circulation dehumidification path 59, and sends in as warm air in wash-cum-the dehydration tack 53 at a heater 58 with a fan 57 again, and clothing is dried. Clothing is dried repeating this flow.
[0004] Drawing 6 is an example of the wash dryer for businesses, in this drawing, 103 is a tub outside a washer, in this tub 103 outside a washer, the cistern 102 which carries out opening to a front-face side is arranged, and the washing input port sealed with the lid which is not illustrated is formed in the front face of the tub 103 outside a washer which attends opening of this cistern 102. Furthermore, in the cistern 102, the drum 101 which holds the washing is arranged pivotable at the circumference of a horizontal axis. Moreover, the detergent input port 104 which supplies a detergent, a fabric softener, a bleaching agent, etc. is established in one flank of the tub 103 outside a washer of the cistern 102 upper part.
[0005] The desiccation processor of this wash dryer 100 is what constitutes the circulation path which is made to dehumidify and dry the moist air exhausted from the drum 101, and is returned to a drum 101. When drying the circulation duct 105 which lets a circulation wind pass, the fan 106 of the desiccation style who circulates a wind, and the washing It has the heater 108 for drying the washing which heated the cooling dehumidification duct 107 and circulation wind which the drum exhaust air and cooling water which were alike, and heat exchange was carried out and became low temperature are made to react, and carry out water-cooled dehumidification, and was held in the drum 101. Moreover, 109 is a heat exchanger which carries out heat exchange of heat-and-high-humidity drum exhaust air and the low-humidity/temperature air after water-cooled dehumidification, when drying the washing. The inclination of dozens of times is established applying [this / 109] it to an outlet side from the entry side of drum exhaust air, and even when the air which came out of the drum 101 and which contained the steam so much dews in a heat exchanger 109, it can drain it automatically.
[0006] the elevated temperature around 60 degrees C which contains a steam so much which came out of the drum 101 when a heater 108 is energized and desiccation was started at the desiccation process with this wash dryer 100 — humid exhaust air After the waste thread under exhaust air is caught with a filter 110, in a heat exchanger 109, heat exchange is carried out to the air around 30 degrees C with which the low warm air and indoor air after water-cooled dehumidification were mixed, and it becomes the air of the low temperature around 40 degrees C. A part of moisture contained in that air dews within a heat exchanger 109, and flows out of the exhaust port of the cooling dehumidification duct 107 according to the inclination of the heat exchanger 109 which leaned dozens times (this operation gestalt about 30 degrees), and was installed. moreover, the air of the low temperature around 40 degrees C by which heat exchange was carried out is further cooled with tap water within the cooling dehumidification duct 107 — having — the low temperature around 35 degrees C — it becomes damp air and the low temperature side of a heat exchanger 109 is supplied as low warm air after water-cooled dehumidification (air for cooling). The water and tap water which were condensed out of air within this cooling dehumidification duct 107 are drained from an exhaust port. moreover, the air supplied to the low temperature side of a heat exchanger 109 incorporates the indoor air (air of the duct exterior) inhaled by work of the fan 106 of the desiccation style from some holes of the duct of the upstream, and it carries out heat exchange in a heat exchanger 109 — having — the low temperature around 38 degrees C — after becoming damp air, after being heated before and after 120 degrees C at a heater 108, a drum 101 is supplied, and the washing is dried.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] Drying efficiency can be raised by forming the thermal-spraying coat which becomes the inner surface of the inner lid of a wash dryer from a far-infrared radiator. Since it is coat formation especially by thermal spraying, coating thickness can be made thin and the fabrication cost of a far-infrared radiator can be reduced.
[0027] When coal combustion ashes are used as an ingredient of a far-infrared radiator, while being able to reduce ingredient cost, it also becomes effective use of trash. Moreover, radiation of the far infrared rays from a far-infrared radiator can be further raised by heating the thermal-spraying coat which installs a heater in an inner lid and becomes it from a far-infrared radiator.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the way, although desiccation of the clothing in the conventional wash dryer is dried by the warm air heated at the heater, the air capacity and the blasting force of warm air which are sprayed to the clothing on the structure of a wash dryer and in wash-cum-a dehydration tack are not enough, and there is a problem that drying efficiency is low and desiccation takes long duration, in desiccation by this warm air. The lowness of the drying efficiency by such warm air is not restricted to a wash dryer, and is the same also in the clothes dryer of dedication.
[0008] On the other hand, in order to raise the drying efficiency of a dryer, sticking a far-infrared radiator on the device inner surface of a dryer is already known. For example, stretching the ceramics as a far-infrared radiator inside the dry matter-ed hold section of a clothes dryer or a tableware dryer to JP,7-9282,U is indicated. However, the presentation of the ceramics as a far-infrared radiator and the publication about the approach to description or a device inner surface stick are not in this official report, and the concrete effectiveness by this is not indicated, either.
[0009] In the desiccation process of a wash dryer, the technical problem which this invention should solve adds a desiccation acceleration function to desiccation by warm air further, and is to raise drying efficiency more.

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MEANS

[Means for Solving the Problem] This invention is characterized by forming the thermal-spraying coat which becomes the inner surface of the inner lid of the wash dryer equipped with the wash function and the desiccation function from a far-infrared radiator. Here, the plasma metal spray approach is employable as the thermal-spraying approach, using coal combustion ashes as an ingredient of said far-infrared radiator. Furthermore, the thermal-spraying coat which installs a heater in an inner lid and becomes it from a far-infrared radiator can also be heated.
[0011] In this invention, the thermal-spraying coat which becomes the inner surface of the inner lid of a wash dryer from a far-infrared radiator is formed. Since the far-infrared radiator used with the conventional dryer is a Plastic solid manufactured by the sintering process, according to the magnitude of the plane area of a Plastic solid, thickness becomes thick inevitably, if it is the magnitude of the plane area of an inner lid inner surface, several mm or more will be needed and, as for thickness, the fabrication cost of a far-infrared radiator will become high. On the other hand, since coating thickness can be adjusted to about 0.05-0.2mm regardless of the magnitude of the plane area of a far-infrared radiator when based on a spraying process, coating thickness can be made thin within limits from which required far-infrared Radiation Effects is acquired, and the fabrication cost of a far-infrared radiator can be reduced.
[0012] as the ingredient of a far-infrared radiator -- sinter molding -- the ceramic fine particles conventionally used as the body and its function can be used. Moreover, coal combustion ashes can also be used. When coal combustion ashes are used, while being able to reduce ingredient cost, it also becomes effective use of trash.
[0013] Coal combustion ashes are the fines which used the oxide of aluminum, Si, and Fe as the principal component, and a thermal-spraying object has a good far-infrared radiation property by being put to an elevated temperature in the combustion process of coal, and being further put to an elevated temperature in a thermal-spraying process. The ashes after coal combustion are fines which are about several micrometers, and particle size adjusts particle size of these fines (classification, grinding), and makes them the particle size of about 10-70 micrometers which can be adapted for thermal spraying.
[0014] Since high thermal-spraying temperature is needed when using ceramic fine particles and coal combustion ashes as an ingredient of a far-infrared radiator, it is desirable to use a plasma spraying equipment as thermal spraying equipment used for thermal spraying. The plasma spraying equipment itself is well-known, for example, it can form a thermal-spraying coat in JP,7-62517,A, JP,8-109463,A, JP,8-225912,A, etc. using the thermal spraying equipment of a publication.
[0015] Moreover, radiation of the far infrared rays from a far-infrared radiator can be further raised by installing a heater in the inner lid of a wash dryer, and heating the thermal-spraying coat which consists of a far-infrared radiator.
[0016]
[Embodiment of the Invention] Drawing 1 is drawing showing an open beam condition for the inner lid of the wash dryer in the operation gestalt of this invention. Drawing 2 is drawing showing the cross-section structure of an inner lid. The basic configuration of the wash dryer 10 is the same as that of the wash dryer shown in drawing 6 , it is supported free [a revolution of wash-cum-the dehydration tack 2] inside a body 1, and wash-cum-the dehydration tack 2 is formed in the lid 3 in a wrap.
[0017] At the desiccation process of the washing with this wash dryer 10, it changes into the condition of immobilization of wash-cum-the dehydration tack 2, and the inner lid 3 is shut, forward counterrotation of the rotary wing in wash-cum-the dehydration tack 2 (not shown) is carried out intermittently, the washing is agitated, warm air is sent in in wash-cum-the dehydration tack 2, and the washing is dried. In this desiccation process, the thermal-spraying coat 4 which consists of a far-infrared radiator with the heater unit 34 prepared in the interior of the inner lid 3 is heated, and desiccation of the washing is promoted with the far infrared rays emitted from the thermal-spraying coat 4.
[0018] As the cross-section structure of the inner lid 3 is shown in drawing 2 , the rib 33 made from aluminum is formed between the heat insulator 31 made of synthetic resin, and an aluminum plate 32, and the heater unit 34 is formed in the section formed with each rib 33. The thermal-spraying coat 4 with a thickness of about 100 micrometers it is thin from a far-infrared radiator is formed in the background of the aluminum plate 32 of this inner lid 3. The thermal-spraying coat 4 carries out thermal spraying of the ceramic fine particles as a far-infrared radiator with a plasma spraying equipment, and forms them.
[0019] [Example of a trial] The ceramic fine particles (K-166 trade name) by Showa Denko K.K. were used as a far-infrared radiator. The thermal-spraying coat with a thickness of about 100 micrometers was formed in the inner surface of the inner lid of a wash dryer by using these ceramic fine particles as a thermal spray material. The heater was formed in the interior of an inner lid, the on-off switch of a heater was formed, and the comparative study of drying efficiency was performed combining the existence of heater heating.
[0020] A test result is shown in drawing 3 and drawing 4 . In both drawings, O mark is a test result with a wash dryer with the inner lid of the conventional type which does not form the far-infrared radiator coat, - mark and ** mark are the wash dryers of this invention which formed the far-infrared radiator coat in the inner lid, and - mark is a test result in with heater heating in heater heating nothing and ** mark.
[0021] Drawing 3 is a graph which shows the relation between the weight of a dry matter-ed, and the drying time. With the wash dryer in which the far-infrared radiator coat was formed, the drying time is shortened by the inner lid 10 to 20% compared with the conventional wash dryer so that drawing 3 may show. In with heater heating, as compared with the case where he has no heater heating, the drying time is shortened further.
[0022] Drawing 4 is a graph which shows the relation between the weight of a dry matter-ed, and power consumption. compared with the wash dryer conventional with the wash dryer which formed the far-infrared radiator coat in the inner lid, power consumption is comparable so that drawing 4 may show -- or it decreases 5 to 10%. Although power consumption increases a

little as compared with the case where he has no heater heating in with heater heating, it still does not increase from the case of the conventional wash dryer.

[0023] A table 1 is a table showing an example of the component of coal combustion ashes. Coal combustion ashes use SiO2, aluminum 2O3, and Fe2O3 as a principal component, in addition contain CaO, TiO2, etc., and are the ceramics as a far-infrared radiator, and a similar component. When the thermal-spraying coat was formed in the inner surface of the inner lid of a wash dryer by using these coal combustion ashes as a thermal spray material, the same result as the test result shown in drawing 3 and drawing 4 was obtained.

[0024]

[A table 1]

成分	含有量 %
SiO_2	55.78
Al_2O_3	22.15
Fe_2O_3	6.84
CaO	2.30
TiO_2	1.69
P2O5	0.73
Na2O	0.58
K2O	0.57
MgO	0.42
SO3	0.39
その他	7.48

[0025] In addition, although the above was the example which applied this invention to the wash dryer for home use, the same result was obtained also in the drying test which applied this invention to the wash dryer for businesses.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is drawing showing an open beam condition for the inner lid of the wash dryer in the operation gestalt of this invention.
[Drawing 2] It is drawing showing the cross-section structure of an inner lid.
[Drawing 3] It is the graph which shows a drying test result.
[Drawing 4] It is the graph which shows a drying test result.
[Drawing 5] It is drawing showing the example of a wash dryer.
[Drawing 6] It is drawing showing the example of a wash dryer.
[Description of Notations]
1 Body
2 Wash-cum-Dehydration Tack
3 Inner Lid
4 Thermal-Spraying Coat
10 Wash Dryer
31 Heat Insulator
32 Aluminum Plate
33 Rib
34 Heater Unit

[Translation done.]

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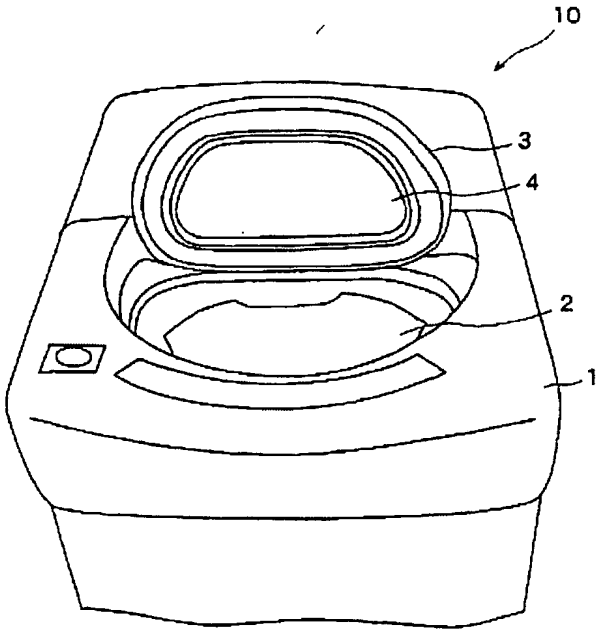
(54)【発明の名称】　洗濯乾燥機

(57)【要約】
【課題】　洗濯乾燥機の乾燥工程において、温風による乾燥にさらに乾燥促進機能を加え、乾燥効率をより向上させる。
【解決手段】　洗濯乾燥機の内蓋３の内面に、遠赤外線放射体からなる溶射被膜４を形成することにより、乾燥効率を高めることができる。とくに溶射による被膜形成であるので、被膜厚さを薄くすることができ、遠赤外線放射体の製作コストを低減することができる。遠赤外線放射体の材料として石炭燃焼灰を用いた場合は、材料コストを低減できるとともに、廃棄物の有効活用にもなる。また、内蓋３にヒータユニット３４を設置して遠赤外線放射体からなる溶射被膜４を加熱することにより、遠赤外線放射体からの遠赤外線の放射をさらに高めることができる。



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【特許請求の範囲】

【請求項１】　洗濯機能と乾燥機能とを備えた洗濯乾燥機の内蓋の内面に、遠赤外線放射体からなる溶射被膜を形成したことを特徴とする洗濯乾燥機。

【請求項２】　前記遠赤外線放射体の材料として石炭燃焼灰を用いた請求項１記載の洗濯乾燥機。

【請求項３】　遠赤外線放射体からなる溶射被膜を加熱するヒータを内蓋に設置した請求項１または２記載の洗濯乾燥機。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は洗濯した後の衣類を乾燥する乾燥機に関し、とくに洗濯機能と乾燥機能とを備えた洗濯乾燥機の乾燥効率を向上させる技術に関する。

【０００２】

【従来の技術】洗濯機能と乾燥機能とを備えた洗濯乾燥機は、従来の事業用のものに加えて近年は家庭用のものも実用化されつつある。図５は家庭用の洗濯乾燥機の一例であり、洗濯乾燥機機５０は、本体５１と、この本体５１の内部に支持された受け筒５２と、受け筒５２の内部に回転自在に支持された洗濯兼脱水槽５３と、洗濯兼脱水槽５３の底部に設けられ外周部に垂直または斜めに立ち上がった傾斜部を持つ略ナベ型の形状を有する回転翼５４と、回転翼５４を取り付けた洗濯軸５５に連結し、受け筒５２に固定されたモータ５６と、ファン５７とヒータ５８からなる温風送風手段と、循環除湿経路５９と、送風口６０が設けられた内蓋６１などにより構成されている。

【０００３】そして、乾燥工程時に、モータ５６で回転翼５４を間欠的に正逆回転駆動して衣類を撹拌し、ファン５７により送風される空気をヒータ５８で加熱し、伸縮性チューブ６２を介して洗濯兼脱水槽５３内に送風口６０より送り込む。そして、回転翼５４によって撹拌されている衣類と温風が接触することで、衣類に含まれている水分の発散が進む。このような撹拌を間欠的に正逆方向に繰り返し行いながら、循環除湿経路５９の中で温風に含まれた水分を凝縮し、除湿を行い、再びファン５７とヒータ５８により洗濯兼脱水槽５３内に温風として送り込み、衣類を乾燥させていく。この流れを繰り返しながら、衣類が乾燥されていく。

【０００４】図６は事業用の洗濯乾燥機の一例であり、同図において、１０３は洗濯機外槽であって、この洗濯機外槽１０３内には前面側に開口する水槽１０２が配置されており、この水槽１０２の開口に臨む洗濯機外槽１０３の前面には、図示しない蓋により密閉される洗濯物投入口が形成されている。さらに、水槽１０２内には、洗濯物を収容するドラム１０１が水平軸周りに回転可能に配置されている。また、水槽１０２上方の洗濯機外槽１０３の一側部には、洗剤、柔軟仕上げ剤、漂白剤等を

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投入する洗剤投入口１０４が設けられている。

【０００５】この洗濯乾燥機１００の乾燥処理系は、ドラム１０１から排気された湿潤空気を除湿、乾燥させてドラム１０１に戻す循環経路を構成するもので、循環風を通す循環ダクト１０５、風を循環させる乾燥風ファン１０６、洗濯物を乾燥するときに熱交換されて低温になったドラム排気と冷却水とを反応させて水冷除湿する冷却除湿ダクト１０７、循環風を加熱してドラム１０１内に収容された洗濯物を乾燥するためのヒータ１０８を備えている。また、１０９は洗濯物を乾燥するときに、高温多湿ドラム排気と水冷除湿後の低温低湿空気とを熱交換する熱交換器である。この熱交換器１０９は、ドラム排気の入り口側から出口側にかけて数十度の勾配を設け、ドラム１０１から出てきた、水蒸気を多量に含んだ空気が熱交換器１０９内に結露した場合でも、自然に排水することができるようになっている。

【０００６】この洗濯乾燥機１００による乾燥工程では、ヒータ１０８を通電して乾燥を開始すると、ドラム１０１から出てきた、水蒸気を多量に含む６０℃前後の高温多湿な排気は、フィルター１１０により排気中の糸屑を捕捉された後に、熱交換器１０９において、水冷除湿後の低温空気と室内空気とが混合された３０℃前後の空気と熱交換され、４０℃前後の低温の空気となる。その空気中に含まれる一部の水分は熱交換器１０９内で結露し、数十度（この実施形態では約３０°）傾けて設置された熱交換器１０９の傾きに従い、冷却除湿ダクト１０７の排水口から流れ出る。また、熱交換された４０℃前後の低温の空気は、冷却除湿ダクト１０７内で水道水によりさらに冷却され、３５℃前後の低温低湿な空気となり、熱交換器１０９の低温側に、水冷除湿後の低温空気（冷却用空気）として供給される。この冷却除湿ダクト１０７内で空気中から凝縮した水および水道水は、排水口から排水される。また、熱交換器１０９の低温側に供給された空気は、乾燥風ファン１０６の働きにより上流側のダクトの一部の穴より吸い込まれた室内空気（ダクト外部の空気）を取り込んで、熱交換器１０９において熱交換され、３８℃前後の低温低湿な空気となった後に、ヒータ１０８により１２０℃前後に加熱された上でドラム１０１に供給され、洗濯物を乾燥させる。

【０００７】

【発明が解決しようとする課題】ところで、従来の洗濯乾燥機における衣類の乾燥は、ヒータにより加熱された温風により乾燥するものであるが、洗濯乾燥機の構造上、洗濯兼脱水槽内の衣類に対して吹き付ける温風の風量および吹き付け力が十分でなく、この温風による乾燥では乾燥効率が低く、乾燥に長時間を要するという問題がある。このような温風による乾燥効率の低さは洗濯乾燥機に限られるものではなく、専用の衣類乾燥機においても同様である。

【０００８】一方、乾燥機の乾燥効率を向上させるため

に、乾燥機の機器内面に遠赤外線放射体を張り付けることはすでに知られている。たとえば実開平７－９２８２号公報に、衣類乾燥機や食器乾燥機の被乾燥物収容部の内側に遠赤外線放射体としてのセラミックスを張設することが記載されている。しかしこの公報には、遠赤外線放射体としてのセラミックスの組成、性状や機器内面への張り付け方法についての記載はなく、また、これによる具体的な効果についても記載されていない。

【０００９】本発明が解決すべき課題は、洗濯乾燥機の乾燥工程において、温風による乾燥にさらに乾燥促進機能を加え、乾燥効率をより向上させることにある。

【００１０】

【課題を解決するための手段】本発明は、洗濯機能と乾燥機能とを備えた洗濯乾燥機の内蓋の内面に、遠赤外線放射体からなる溶射被膜を形成したことを特徴とする。ここで、前記遠赤外線放射体の材料として石炭燃焼灰を用い、溶射方法としてプラズマ溶射方法を採用することができる。さらに、内蓋にヒータを設置して遠赤外線放射体からなる溶射被膜を加熱することもできる。

【００１１】本発明においては、洗濯乾燥機の内蓋の内面に遠赤外線放射体からなる溶射被膜を形成する。従来の乾燥機で用いられている遠赤外線放射体は、焼結法により製造された成形体であるので、成形体の平面積の大きさに応じて必然的に厚さが厚くなり、内蓋内面の平面積の大きさであれば厚さは数ｍｍ以上が必要となり、遠赤外線放射体の製作コストが高くなる。これに対し、溶射法による場合は、遠赤外線放射体の平面積の大きさに関係なく被膜厚さを０．０５～０．２ｍｍ程度に調節することができるので、必要な遠赤外線放射効果が得られる範囲内で被膜厚さを薄くすることができ、遠赤外線放射体の製作コストを低減することができる。

【００１２】遠赤外線放射体の材料としては、焼結成形体用として従来用いられているセラミックス粉体を用いることができる。また、石炭燃焼灰を用いることもできる。石炭燃焼灰を用いた場合は、材料コストを低減できるとともに、廃棄物の有効活用にもなる。

【００１３】石炭燃焼灰は、Ａｌ、Ｓｉ、Ｆｅの酸化物を主成分とした微粉であり、石炭の燃焼過程で高温に曝され、さらに溶射過程で高温に曝されることにより、溶射体は良好な遠赤外線放射特性を有するものとなる。石炭燃焼後の灰は、粒径が数μｍ程度の微粉であり、この微粉の粒径を調整（分級、粉砕）して溶射に適応可能な１０～７０μｍ程度の粒径とする。

【００１４】遠赤外線放射体の材料としてのセラミックス粉体や石炭燃焼灰を用いる場合は、高い溶射温度を必要とするので、溶射に用いる溶射装置としてプラズマ溶射装置を使用することが望ましい。プラズマ溶射装置自体は公知であり、たとえば特開平７－６２５１７号公報、特開平８－１０９４６３号公報、特開平８－２２５９１２号公報などに記載の溶射装置を使用して溶射被膜を形成することができる。

【００１５】また、洗濯乾燥機の内蓋にヒータを設置して、遠赤外線放射体からなる溶射被膜を加熱することにより、遠赤外線放射体からの遠赤外線の放射をさらに高めることができる。

【００１６】

【発明の実施の形態】図１は本発明の実施形態における洗濯乾燥機の内蓋を開けた状態を示す図である。図２は内蓋の断面構造を示す図である。洗濯乾燥機１０の基本構成は図６に示した洗濯乾燥機と同様であり、本体１の内部に洗濯兼脱水槽２が回転自在に支持され、洗濯兼脱水槽２を覆う内蓋３が設けられている。

【００１７】この洗濯乾燥機１０による洗濯物の乾燥工程では、洗濯兼脱水槽２を固定の状態にして内蓋３を閉め、洗濯兼脱水槽２内の回転翼（図示せず）を間欠的に正逆回転させて洗濯物を撹拌し、洗濯兼脱水槽２内に温風を送り込んで洗濯物を乾燥させる。この乾燥工程において、内蓋３の内部に設けたヒータユニット３４により遠赤外線放射体からなる溶射被膜４を加熱し、溶射被膜４から放射される遠赤外線により洗濯物の乾燥を促進させる。

【００１８】内蓋３の断面構造は図２に示すように、合成樹脂製の断熱材３１とアルミニウム板３２の間にアルミニウム製のリブ３３が設けられ、各リブ３３で形成される区間にヒータユニット３４が設けられている。この内蓋３のアルミニウム板３２の裏側に、遠赤外線放射体からなる厚さ約１００μｍの溶射被膜４が形成されている。溶射被膜４は、遠赤外線放射体としてのセラミックス粉体をプラズマ溶射装置により溶射して形成したものである。

【００１９】〔試験例〕遠赤外線放射体として昭和電工株式会社製のセラミックス粉体（Ｋ－１６６商品名）を使用した。このセラミックス粉体を溶射材料として洗濯乾燥機の内蓋の内面に厚さ約１００μｍの溶射被膜を形成した。内蓋の内部にはヒータを設け、ヒータのオンオフスイッチを設けてヒータ加熱の有無を組み合わせて乾燥効率の比較試験を行った。

【００２０】試験結果を図３および図４に示す。両図において、○印は遠赤外線放射体被膜を形成していない従来型の内蓋付きの洗濯乾燥機による試験結果であり、●印と■印は内蓋に遠赤外線放射体被膜を形成した本発明の洗濯乾燥機で、●印はヒータ加熱無し、■印はヒータ加熱有りの場合の試験結果である。

【００２１】図３は被乾燥物の重量と乾燥時間との関係を示すグラフである。図３からわかるように、内蓋に遠赤外線放射体被膜を形成した洗濯乾燥機では従来の洗濯乾燥機に比べて乾燥時間は１０～２０％短縮される。ヒータ加熱有りの場合はヒータ加熱無しの場合に比してさらに乾燥時間が短縮される。

【００２２】図４は被乾燥物の重量と消費電力との関係

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を示すグラフである。図４からわかるように、内蓋に遠赤外線放射体被膜を形成した洗濯乾燥機では従来の洗濯乾燥機に比べて消費電力は同程度または５～１０%低減される。ヒータ加熱有りの場合はヒータ加熱無しの場合に比して消費電力は若干増加するが、それでも従来の洗濯乾燥機の場合より増加することはない。

【００２３】表１は石炭燃焼灰の成分の一例を示す表である。石炭燃焼灰はSiO_2、Al_2O_3、Fe_2O_3を主成分とし、その他ＣａＯ、TiO_2などを含んでおり、遠赤外線放射体としてのセラミックスと類似の成分である。この石炭燃焼灰を溶射材料として洗濯乾燥機の内蓋の内面に溶射被膜を形成したところ、図３、図４に示した試験結果と同様な結果が得られた。

【００２４】

【表１】

成分	含有量　%
SiO_2	５５．７８
Al_2O_3	２２．１５
Fe_2O_3	６．８４
ＣａＯ	２．３０
TiO_2	１．６９
Ｐ２Ｏ５	０．７３
Ｎａ２Ｏ	０．５８
Ｋ２Ｏ	０．５７
ＭｇＯ	０．４２
ＳＯ３	０．３９
その他	７．４８

【００２５】なお以上は、本発明を家庭用の洗濯乾燥機

6

に適用した例であるが、事業用の洗濯乾燥機に本発明を適用した乾燥試験においても同様な結果が得られた。

【００２６】

【発明の効果】洗濯乾燥機の内蓋の内面に、遠赤外線放射体からなる溶射被膜を形成することにより、乾燥効率を高めることができる。とくに溶射による被膜形成であるので、被膜厚さを薄くすることができ、遠赤外線放射体の製作コストを低減することができる。

【００２７】遠赤外線放射体の材料として石炭燃焼灰を用いた場合は、材料コストを低減できるとともに、廃棄物の有効活用にもなる。また、内蓋にヒータを設置して遠赤外線放射体からなる溶射被膜を加熱することにより、遠赤外線放射体からの遠赤外線の放射をさらに高めることができる。

【図面の簡単な説明】

【図１】　本発明の実施形態における洗濯乾燥機の内蓋を開けた状態を示す図である。

【図２】　内蓋の断面構造を示す図である。

【図３】　乾燥試験結果を示すグラフである。

【図４】　乾燥試験結果を示すグラフである。

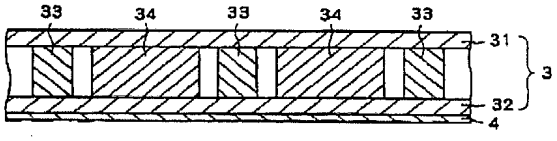
【図５】　洗濯乾燥機の例を示す図である。

【図６】　洗濯乾燥機の例を示す図である。

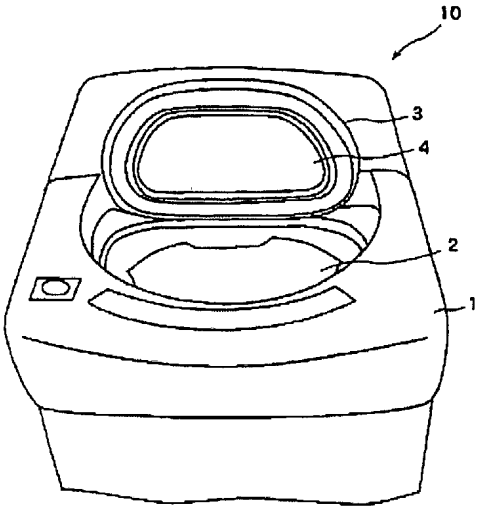
【符号の説明】

１　本体
２　洗濯兼脱水槽
３　内蓋
４　溶射被膜
１０　洗濯乾燥機
３１　断熱材
３２　アルミニウム板
３３　リブ
３４　ヒータユニット

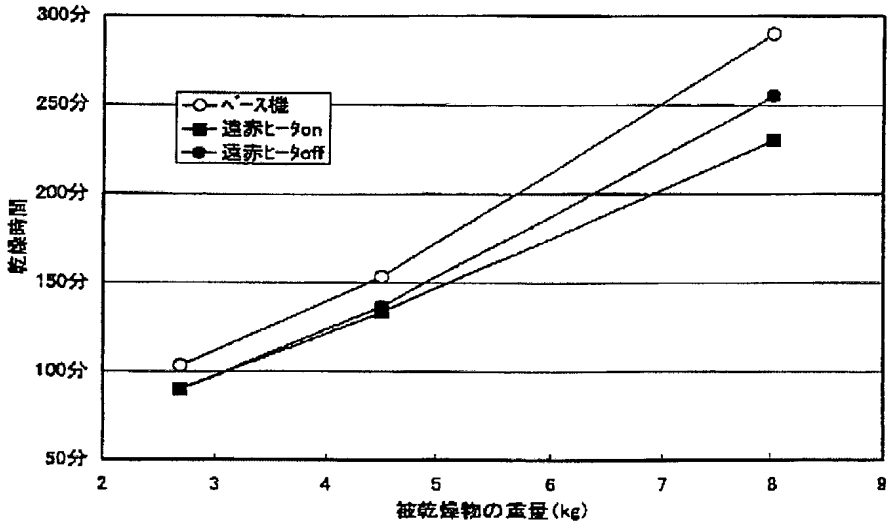
【図２】



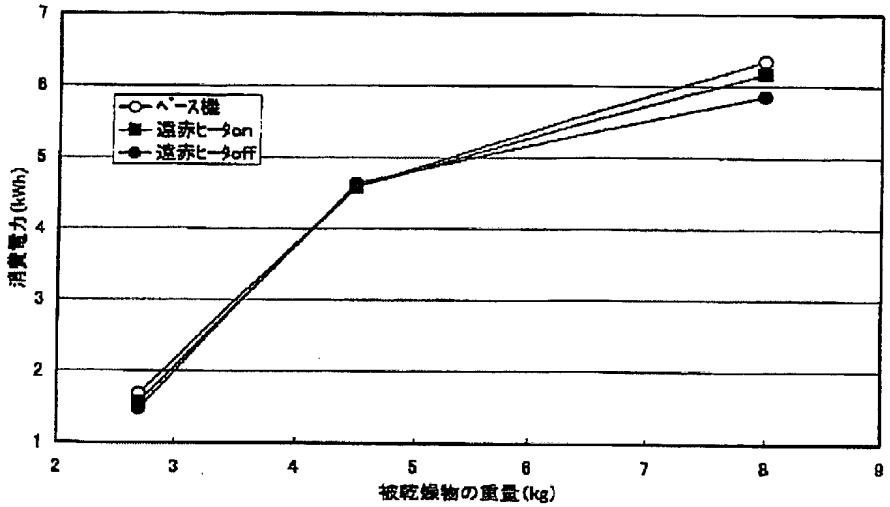
【図１】


10
3
4
2
1

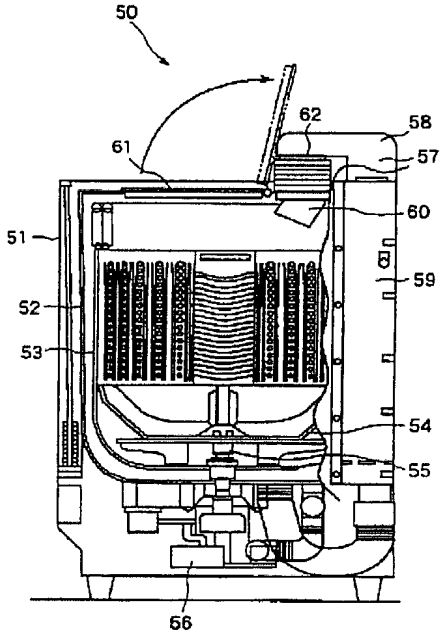
【図３】


300分
250分
200分
150分
100分
50分
乾燥時間
ベース機
遠赤ヒータon
遠赤ヒータoff
2
3
4
5
6
7
8
9
被乾燥物の重量(kg)

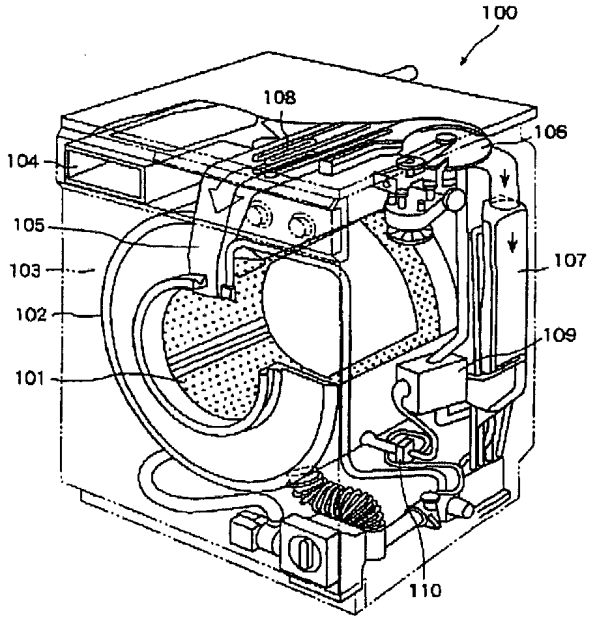
【図４】


ベース機
遠赤ヒータon
遠赤ヒータoff
消費電力(kWh)
被乾燥物の重量(kg)
1
2
3
4
5
6
7
2
3
4
5
6
7
8
9

【図５】


50
61
62
58
57
60
51
59
52
53
54
55
56

【図６】


100
108
106
104
105
103
102
101
107
109
110